APPENDIX B: COMPUTER SOFTWARE FOR LICENSE PLATE MATCHING

This appendix contains documentation for license plate collection and matching computer software that is used to collect travel times. Chapter 4 of the handbook described the manual and portable computer-based methods of travel time collection that can utilize software for automating data collection and reduction.

Only a single version of license plate collection and matching software is presented in this appendix, but other versions are available at cost through the McTrans or PC-Trans software distribution centers. The license plate collection and matching functions of this and similar software can be replicated in most basic programming languages or spreadsheet/database macro languages.

1 Texas Transportation Institute's License Plate Collection and Matching Software

The Texas Transportation Institute (TTI) modified the "SPEEDRUN" and "MATCH" software developed by the Chicago Area Transportation Study (CATS) for use in NCHRP Project 7-13, *Quantifying Congestion*. The modified software programs are called "TTCOLLEC" and "TTMATCH". The software is available and freely distributed by TTI [contact Shawn Turner at (409) 845-8829].

1.1 Instructions for Using License Plate Collection and Matching Software

All data collection personnel should be familiar with the collection software and should have one to two hours of practice reading and entering license plate numbers. Observers should arrive at the designated collection site 10 to 15 minutes in advance to prepare for data collection. Depending upon the method of data collection, 30 to 60 minutes should be enough time to collect an adequate number of license plates at a particular station. As a minimum, you should expect that approximately 5 to 10 percent of the collected license plates will result in matches. A preliminary analysis of the first day's data should provide a better idea of collection times and matching percentages.

The following steps should be taken to prepare the portable computer for data collection:

1. Create a travel time data collection sub-directory on the hard disk drive of the portable computer (or floppy disk if no hard drive exists).

2. Copy the TTCOLLEC.EXE collection program into the data collection sub-directory.

1.1.1 Data Collection

The following steps should be taken to begin data collection on the portable computer:

1. Type “TTCOLLEC” from the data collection sub-directory to start the collection program. Press any key to continue past the title screen.

2. The user will be prompted for an input file name and path. If no path is typed the input data file will be created in the current data collection directory. Type a logical file name for your data file, and consider using a file name extension like “.1", “.2”, “.3”, etc., corresponding to the relative position or location of the checkpoint.

3. Answer prompts regarding the study route, direction of traffic flow (two letters only), your location, and the weather conditions or other comments. The responses to these prompts, along with the file name, will be included as a header at the beginning of the data file. This information will also be included at the top of each data entry screen.

4. After answering the “weather conditions or other comments” prompt, a plate entry screen will appear. There are three fields: one for an 8-digit plate number, one for a 2-letter state abbreviation, and one for comments (70 characters). There are several function keys in the plate entry screen:

   - “TAB” moves the cursor between fields.
   - "*" (asterisk) clears screen without saving entry (updates on-screen clock).
   - “RETURN” or “ENTER” saves the plate entry and refreshes the entry screen.
   - “ESCAPE” exits the program and saves the data file.

   In addition, the arrow keys “←”, “→”, “↑”, and “↓” can be used to move the cursor within and between fields. The “BACKSPACE” and the space bar can be used to delete an entry.

   If the TTCOLLEC program is exited accidentally during data collection (e.g., from temporary loss or interruption of power), restart the program and use the same file name as before. The program will append your new data to the original input file.

5. When data collection is complete, press “ESCAPE” to exit the program. All observers should enter plate numbers in a uniform and consistent manner (e.g., first four plate characters in upper-case type). The matching program is only capable of matching plate numbers that have been entered identically. Data files should be copied onto a permanent storage disk (e.g., office computer or backup floppy disk) at the end of each day of data collection.

1.1.2 Data Reduction

Preliminary data reduction, like plate matching, can be performed in the field. Final data reduction and analysis should be performed in the office once the data collection for a route is complete. The computer program "TTMATCH" is used to match the license plates collected by "TTCOLLEC". The TTMATCH.EXE file should be copied into the data collection sub-directory before proceeding.

The following steps should be taken to match license plates:

1. Copy the data files into the data collection sub-directory. The program is only capable of matching two data files at once.

2. From the data collection sub-directory, type "TTMATCH". The program will prompt you for names of the two input data files that contain the license plates to be matched. If the data files are not in the data collection sub-directory, the path must be specified. The program will also prompt you for the name of the summary output file (use the extension "*.out"), which is user-specified. If no path is specified for the output file, it will be created in the current data collection sub-directory.

3. You will be prompted for the run distance, and whether you wish to set speed limits for the license matching procedure. The speed limits feature can eliminate most spurious matches if used properly. If the speed limits feature is used, set the limits so that practically no vehicle could have traversed the study section outside of these limits. For example, speeds above 100 mph or below 5 mph may be used on freeways, whereas above 70 mph or below 5 mph may be more appropriate for arterial streets. The speed limits should be based on local route and traffic conditions.

4. The program will proceed to match the plates in the two data files. Some spurious matches are automatically eliminated by the program (discards observations greater or less than two standard deviations from the mean), and a summary output file will be created with your specified file name in the data collection sub-directory or the user-specified path.

The output file contains summary statistics and a list of all matched plates and corresponding speeds in a text file (comma-separated values). The individual speed estimates can be examined to further eliminate any identifiable spurious matches through visual inspection, graphing, or statistical procedures. The output file can also be imported into a spreadsheet or statistical analysis software for final data reduction and analysis.

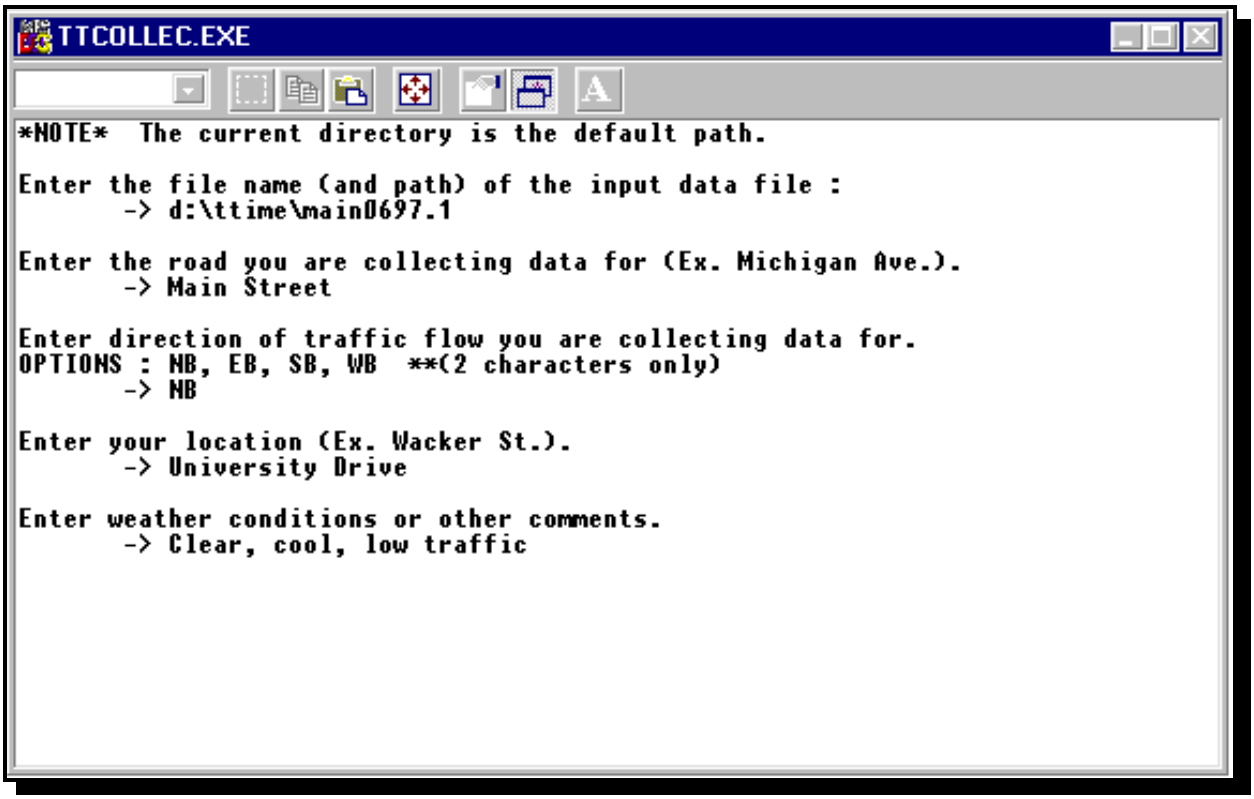


Figure B-1. TTCOLLEC Site Information Entry Screen

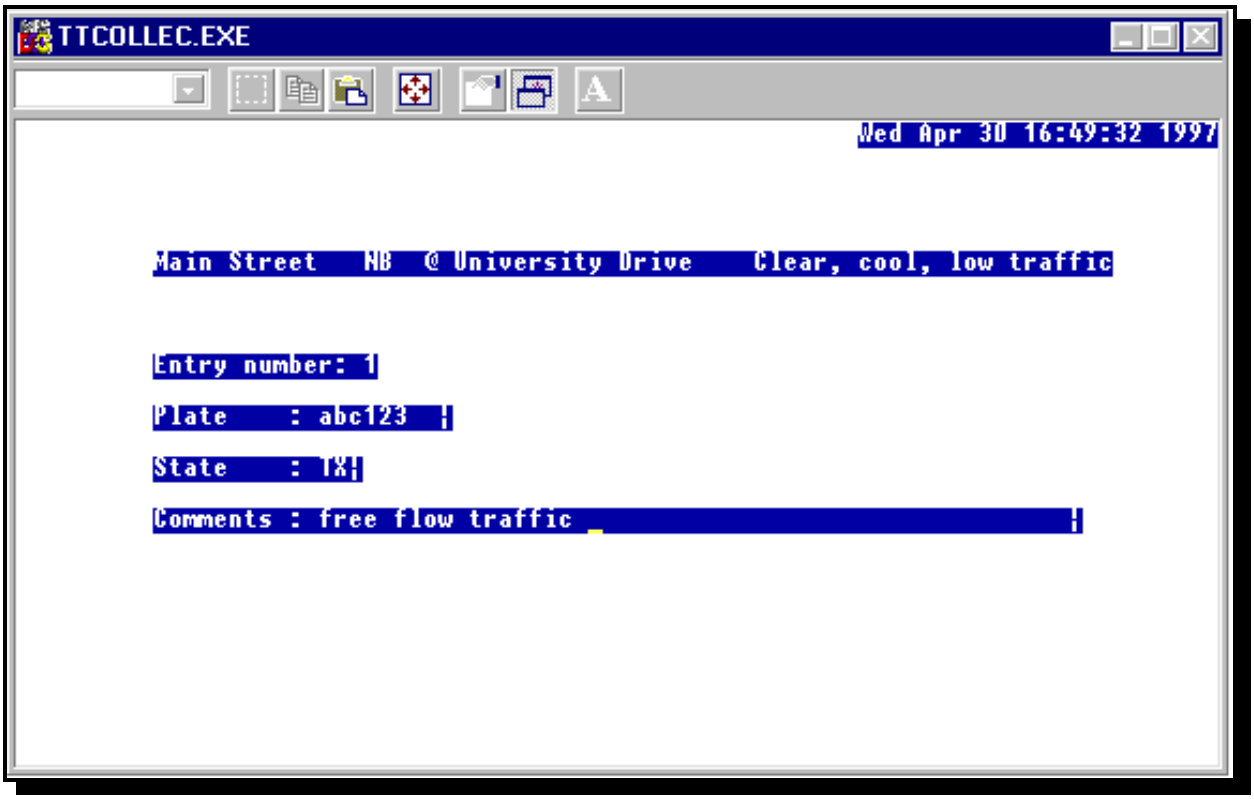


Figure B-2. TTCOLLEC License Plate Entry Screen

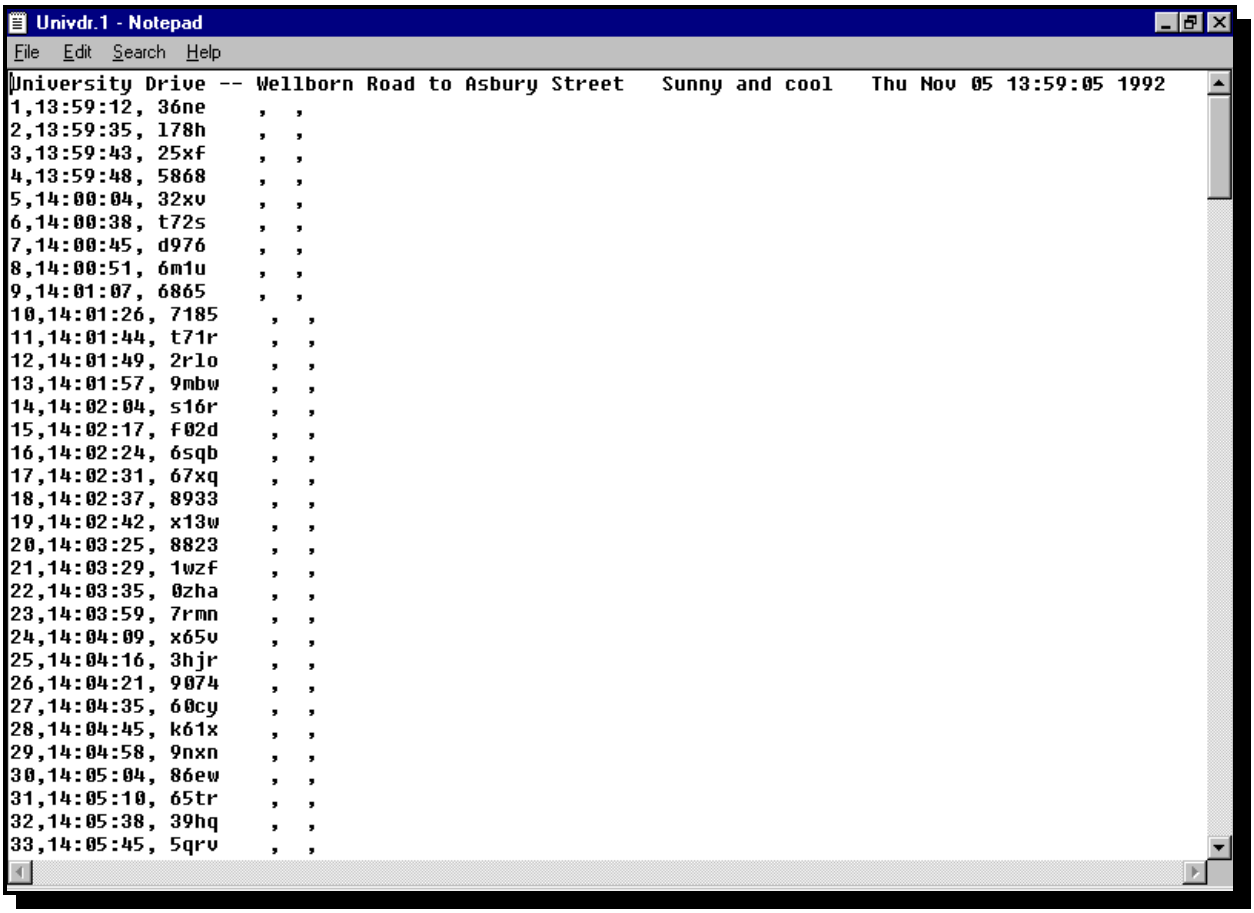


Figure B-3. Example Input Text File for TTMATCH

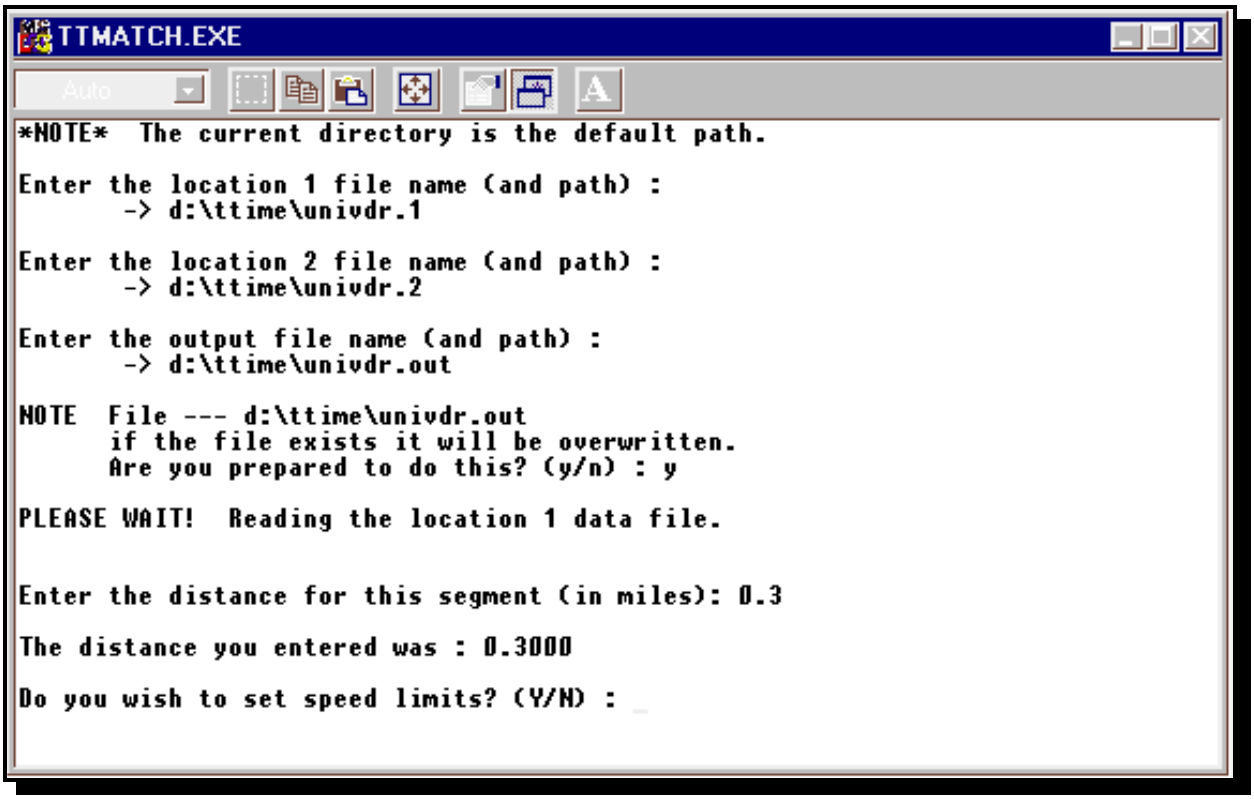
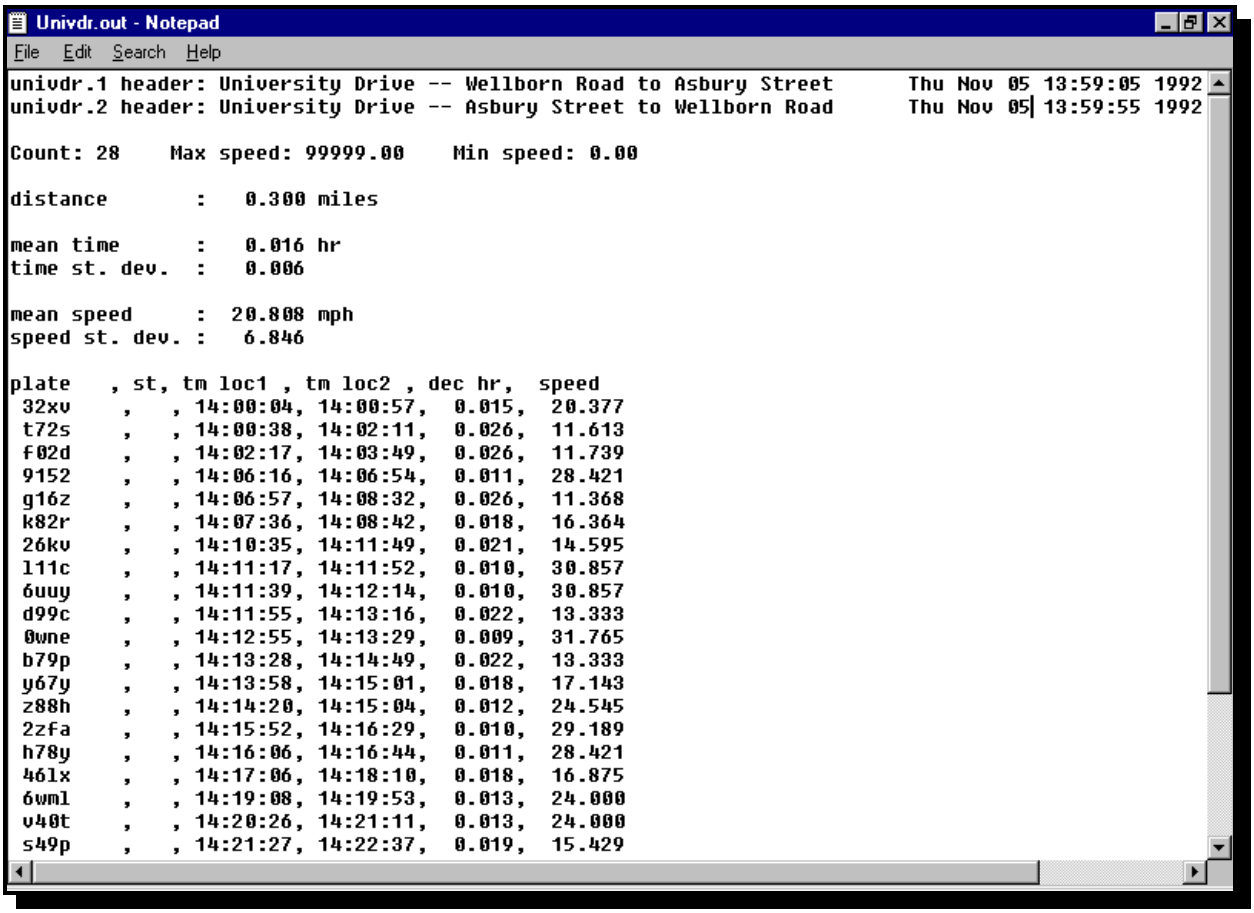


Figure B-4. Example Matching Input Screen for TTMATCH



Univdr.out - Notepad

File Edit Search Help

```
univdr.1 header: University Drive -- Wellborn Road to Asbury Street      Thu Nov 05 13:59:05 1992
univdr.2 header: University Drive -- Asbury Street to Wellborn Road      Thu Nov 05 13:59:55 1992

Count: 28    Max speed: 99999.00    Min speed: 0.00

distance       :   0.300 miles

mean time      :   0.016 hr
time st. dev.  :   0.006

mean speed     :  20.808 mph
speed st. dev. :   6.846

plate   , st, tm loc1 , tm loc2 , dec hr,  speed
 32xv    ,   , 14:00:04, 14:00:57,  0.015,  20.377
 t72s    ,   , 14:00:38, 14:02:11,  0.026,  11.613
 f02d    ,   , 14:02:17, 14:03:49,  0.026,  11.739
 9152    ,   , 14:06:16, 14:06:54,  0.011,  28.421
 g16z    ,   , 14:06:57, 14:08:32,  0.026,  11.368
 k82r    ,   , 14:07:36, 14:08:42,  0.018,  16.364
 26kv    ,   , 14:10:35, 14:11:49,  0.021,  14.595
 l11c    ,   , 14:11:17, 14:11:52,  0.010,  30.857
 6uuy    ,   , 14:11:39, 14:12:14,  0.010,  30.857
 d99c    ,   , 14:11:55, 14:13:16,  0.022,  13.333
 0wne    ,   , 14:12:55, 14:13:29,  0.009,  31.765
 b79p    ,   , 14:13:28, 14:14:49,  0.022,  13.333
 y67y    ,   , 14:13:58, 14:15:01,  0.018,  17.143
 z88h    ,   , 14:14:20, 14:15:04,  0.012,  24.545
 2zfa    ,   , 14:15:52, 14:16:29,  0.010,  29.189
 h78y    ,   , 14:16:06, 14:16:44,  0.011,  28.421
 461x    ,   , 14:17:06, 14:18:10,  0.018,  16.875
 6wml    ,   , 14:19:08, 14:19:53,  0.013,  24.000
 v40t    ,   , 14:20:26, 14:21:11,  0.013,  24.000
 s49p    ,   , 14:21:27, 14:22:37,  0.019,  15.429
```

Figure B-5. Example Output Text File from TTMATCH